



Consultant Standards For PS&E 2010 EDITION



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Introduction

Frequent changes to PS&E and differences in Contract Documents from project to project and facility to facility lead to misinterpretation, inconsistent enforcement, higher bid prices, and Contractor claims.

This manual is intended to serve as the City of San Diego Engineering & Capital Projects Department's standards for the preparation of Plans, Specifications, and Estimates (PS&E) by Consultants. It provides a basis for the City's review and approval of consultant prepared PS&E submittals for consistency and compliance with the City's policies and guidelines.

City Consultants are required to review this manual, become familiar with it and follow these standards.

In unique cases, these guidelines may be waived only after consultation with the City Engineer or designee.

Changes from the standards shall be documented on the Standard Change Request Form in the Project files. A copy of the form shall be sent to the Specifications Engineer.

“Plans - The drawings, profiles, cross sections, Standard Plans, working drawings, and shop drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions, or details of the Work.”

The GREENBOOK, Section 1-2

1.1 CADD STANDARDS

1.1.1 The City’s CADD Standards have been developed with the following objectives:

- a) Enhance the level of graphic consistency.
- b) Provide consistent and uniform symbols and abbreviations in the Contract Documents to minimize confusion in the interpretation of the Contract Documents.
- c) Maintain an acceptable level of quality and clarity in the contract drawings.
- d) Supply information to the Design Consultants and Design-Builders relating to the design and drafting methods.

1.1.2 The City’s standard policy requires not to mix Plans and Specifications (see Attachment A). The purpose of the Construction Notes on the Plans is only to highlight or bring attention to unique or special aspects, construction details, or to cross reference the special provisions. Special Provisions or other contract terms and conditions are what they are and shall remain out of the drawings. It’s important to note that the Specifications have precedence over the Plans.

1.2 SOFTWARE

1.2.1 Although the City of San Diego uses the Bentley MicroStation as its basic CADD graphics engine, coupled with Intergraph engineering application programs for engineering design and drawing production, Design Consultants may use other industry standard CADD systems e.g., AutoCAD for hard copy submittals or PDF files submitted on compact disc for printing purposes. However, for compatibility

reasons, all electronic CADD files submitted to the City to be uploaded into the City's CADD system shall be created in MicroStation, and conform to the requirements set forth in these standards.

- 1.2.2 The terminology used in these standards follows the customary usage for MicroStation systems, recognizing that other CADD systems use different terms for similar concepts.
- 1.2.3 Requests for updated information shall be directed to the City Capital Improvement Program (CIP) Project Manager or designee administering the Design Consultant's contract.

1.3 TRANSMITTING ELECTRONIC DATA TO THE CITYWIDE

- 1.3.1 The exchange or transmittal of electronic data from Design Consultant to Design Consultant is not permitted. Electronic data distribution shall be through the appropriate City staff.
- 1.3.2 When required, the Project Manager contacts the Consultant to request interim submittals of the latest design data for transmittal to other affected projects. Prior to disseminating interim submittals, the City CADD Coordinator reviews the electronic data for compliance with these standards.
- 1.3.3 Electronic submittals shall be addressed to the City Project Manager administering the Consultant's Agreement.

1.4 CADD FINAL DELIVERABLES

- 1.4.1 For legal purposes, the primary deliverable for engineering drawings is Mylar plots with original or electronic signatures and seals. Delivery of the corresponding electronic data (PDF, DGN, etc.) for CADD drawings is required. CADD files created during design and construction of City facilities will be used by the City over the life of those facilities. Therefore, the Consultant shall ensure that the design files enable the City, with reasonable effort, to retrieve, use, and modify the CADD files during operation, maintenance, and modification of the facilities.

- 1.4.2 CADD file final deliverables shall be as-built to reflect actual constructed conditions. Files determined by the Project Manager to be corrupt or not in compliance with the City CADD standards are to be returned to the Consultant for correction and re-submission. Electronic files submitted shall be error free as determined by running the file thru Axiom File Fixer or other equal means.

1.5 CADD FILE SPECIFICATIONS

- 1.5.1 Consultants may generate drawings using any CADD application. However, the files shall be delivered in a format compatible with current City standards.

Note:

A new edition of the City's CADD Standards is under development. The current version on E&CP's Web site serves as the adopted version until the City's unified CADD standards are released. The E&CP Web site is located at www.sandiego.gov/engineering-cip.



“Specifications - Standard Specifications, Reference Specifications, Special Provisions, and specifications in Change Orders or Supplemental Agreements between the Contractor and the Board.”

The GREENBOOK, Section 1-2

2.1 CONSTRUCTION SPECIFICATIONS

- 2.1.1 Work requirements shall be clearly stated in the specifications. Well-written specifications are essential to the quality of the City’s Contract Documents and the efficient construction of the project. Well-written specifications are instructions to the Contractor for the work to be performed, the conditions and restrictions on performance of the work, the expected quality of the work, and how the work will be measured for payment. Specifications are not instructions to City staff.
- 2.1.2 The City is committed to the “Plain Language” Act of 2010 and is moving in that direction. To comply with the “Plain Language” principles, well-written specifications meet the following criteria:
- a) Organize materials to serve the needs of the reader by stating construction requirements sequentially and in logical order.
 - b) Use common, everyday words instead of technical jargon and abbreviations.
 - c) Use easy-to-read design features, such as lists, tables, graphics, and "white space."
 - d) Use consistent style and format.
 - e) Are clear, concise, and technically correct.
 - f) Do not use ambiguous words that could lead to misinterpretation.
 - g) Are written using simple words in short, easy to understand sentences.
 - h) Use technically correct terms, not slang or “field” words.

- i) Avoid conflicting requirements.
 - j) Do not repeat requirements stated elsewhere in the contract documents.
 - k) Do not explain or provide reasons for a requirement.
 - l) Complement the Plans and other Contract Documents.
- 2.1.3 The City's specifications follow The GREENBOOK for formatting, style and content to the extent possible. The Style Guide developed by The GREENBOOK Specifications Subcommittee is the standard set of guidelines for writing clear, consistent, and complete specifications (see Attachment D).
- 2.1.4 The typical advertised City construction contracts (i.e., Bid Package) have the following structure and major components:

Volume 1: Front End

1. Cover Page
2. Special Notices (Equal Opportunity Contracting Program [EOCP])
3. Required Document Schedule
4. Invitation to Bid
5. Instruction to Bidders
6. Funding Source Provisions
7. Supplementary Special Provisions (SSP)
8. Attachments

Volume 2: Front End (to be submitted as Bid/Price Proposal)

1. Bid/Proposal
2. Standard Forms

- 2.1.5 In case of Design-Build, Request for Qualifications and Request for Proposals will also be added to the top of this list.
- 2.1.6 In addition to the advertised information, the City's Standard Specifications for Public Works Construction (i.e., The WHITEBOOK) which supplements The GREENBOOK for the post award base specifications is included in the Contract Documents by reference.
- 2.1.7 The technical specifications and Plans are developed by the designers, architects, and engineers during the design phase. The technical specifications describe materials and product information including quality, performance, fabrication, and installation. The materials and products described in the specifications are specific to the project and are graphically represented on the Plans.
- 2.1.8 In combination, the technical specifications, general conditions and requirements (i.e., Part 1, The GREENBOOK and The WHITEBOOK), and Bid Proposal make up the Project Specifications (also referred to as Contract Documents on the cover of the Bid package.)
- 2.1.9 The City's post award standard general conditions are covered by Part 1 of The GREENBOOK and its City generated supplements. Frequent changes to specifications and differences in specifications from project to project and facility to facility lead to misinterpretation, inconsistent enforcement, higher bid prices, and Contractor claims. Therefore, as much as possible, the Standard Specifications, in particular Part 1, shall not be altered (see Attachment B).
- 2.1.10 For CSI based contracts (e.g., non-ROW projects), the general conditions that are usually covered by the Division 1 have long been replaced by Part 1. General conditions and requirements that are above and beyond Part 1 may be submitted in one of the following 2 ways:
1. Incorporated into the Contract as part of the Supplementary Special Provisions (SSP) if they are in The GREENBOOK format.
 2. Attached to the SSP if they are in CSI format provided that it does not overlap and/or contradict Part 1.

- 2.1.11 To maintain consistency for all contracts, any changes or modifications to Part 1 that contain the General Conditions require approval from the City Engineer or designee. The Deputy City Engineer assigned to Quality Control & Standards Section of E&CP has also been designated with the review and approval of the Standard Specifications (see Attachment C).
- 2.1.13 The key to successful development of the technical specifications is to start with the SSP for each project. Design team members shall specifically avoid copying an old or previous specification from a prior similar project. Starting from scratch (the boiler SSP) will require additional time, but will eliminate the potential of copying old mistakes or the inclusion of outdated requirements.
- 2.1.14 The SSP is initially edited by the Contract Processing Group based on the information provided on the (Project Information Sheet) PIS to remove irrelevant or non-applicable specification sections. By doing this, the SSP is molded into the project specifics, simplified, and reduced in size and complexity.
- 2.1.15 Design team members shall begin assembling the Specifications parallel to the start of the Design Phase. Specifications shall be substantially complete at the 60% design milestone and shall be ready for final constructability review at the 100% milestone. Final specifications will be signed and stamped appropriately (see Chapter 3).
- 2.1.16 If "sole source" is the only means or method desired, the specification shall clearly state this with a complete description of function, performance, or both.

2.2 STANDARD DOCUMENT FORMAT

2.2.1 PAGE LAYOUT:

- | | |
|---------------|--|
| a) Font Style | Times New Roman |
| b) Font Size | 11 points |
| c) Alignment | Justified (Full) |
| d) Margins | 1" – Top, 1" – Bottom, 1" – RT Side, 1.25" – Lt Side (if printed double sided) |

- e) Tab 5 space increments from left
- f) Software MS Word Office 2007

2.2.2 INDIVIDUAL PARTS OF TECHNICALS:

Submit all appendices and technical specifications electronically in MS Word format as one single file, unless they are available only in PDF format and do not require further changes by Contract Processing. Any changes to the PDF shall be done by the Consultant.

- 2.2.3 The section number and title shall be aligned at the top of the page and centered. See below:

SECTION 01600 - MATERIALS AND EQUIPMENT
--

- 2.2.4 The information shall be organized and divided into sections and subsections or subparts for clarity. For specific requirements, refer to The GREENBOOK Style Guide (see Attachment D).

- 2.2.5 Headers: Use headers where necessary.

- 2.2.6 Footers: Follow the default Footer format that is included in the boilers and complete the blanks. (See example below):

DOCUMENT TITLE	PAGE NUMBER
CONTRACT TITLE	

2.2.7 APPLICATION OF PAGE AND SECTION BREAKS:

A contract document will most likely be broken up into many sections in order to accommodate different HEADERS/FOOTERS.

- 2.2.8 To separate the information in a Contract Document, use the "Page Break" and "Section Break (Next Page)" break.

- 2.2.9 The "Page Break" is often used to continue a section on the following page.

- 2.2.10 The "Section Break (Next Page)" is used to start both a new page and a new section. This action may require new footers.
- 2.2.11 The "Section Break (Continuous)" is used when the TEXT Requires a Different format (such as when two Columns are needed). Do NOT use for Tables or Graphics or any other information.

NOTE: To view what breaks are being incorporated into the document you will need to have the Show All Symbol (¶) activated.

2.3 SUBCONTRACTING OUTREACH PROGRAM

- 2.3.1 Public Works construction contracts are subject to policies and requirements established by the City of San Diego Equal Opportunity Contracting Program (EOCP) as approved by the Mayor and adopted by the City Council. Federal and State programs take precedence depending on the source of funding. At the City's EOC sole discretion, City requirements may be waived or modified in advance on emergency contracts.
- 2.3.2 An Excel Worksheet has been developed to make the subcontracting participation goals or percentages quickly and consistently. The worksheet is based on the City's standard Master Bid List (MBL). Therefore, cost estimates submitted using non-standard formats will not be accepted (see Chapter 4).

2.4 ADDENDUM

- 2.4.1 Criteria for Addendum: The following is a list of possible situations when an addendum is necessary:
- a) Specification modification
 - b) Bid opening extension, postponement
 - c) Subcontracting Outreach Program percentage change
 - d) Bid item changes
 - e) Drawing sheet changes
 - f) Clarifications and answers to the bidders' questions
 - g) Adding new information, forms

2.4.2 Addendum Parts:

- a) General Information Section - Addendum label ("A", "B", etc., numbers e.g., 1, 2, etc., will be used for design-build projects), bid #, spec #, WBS #, title, bid opening date, time, and issue date.
- b) Q/A Section - Bidders' questions and City's answers.
- c) Clarification Section – Clarifications initiated by the City.
- d) Specification Section - Changes done to the boilerplate, technical provisions, attachments, appendices, forms, and bid schedule.
- e) Plan Section:
 1. All areas covered by the proposed change are bubbled and labeled indicating, "A", "B", etc.
 2. All corrections are in ink on the original signed drawing sheets.
 3. Each bubble is labeled in pencil with the letter change inside a triangle.
 4. If an item is being omitted from the plans, it will be erased from the drawing, not crossed out. In this case, there may be just a blank area with a bubble around it.
 5. In the title block, there are two columns to be filled in:
 - "By" – give company name or initials of company making change. Do not use initials of the person preparing the change. If the change is being made by a new engineering company, the new engineers' signature block shall be added to the drawing sheet.
 - "Description"- indicate the letter change in the block and a brief description. If the description will not fit in the block, put the corresponding change in the block and describe the change in the border area.

6. An electronic copy in PDF format of the changed drawing sheet (half-sized) shall be provided so it can be included and noted in an addendum to be sent to all plan holders and provided to all new purchasers of the plans.
7. If changes to a drawing sheet are extensive, the sheet can be voided and a new sheet added to the plans.
8. If a proposed change requires the addition of a new sheet, it is added to the back of the existing set of plans.
9. When a new sheet is added, all other sheets directly affected by it include the corresponding change and refer to the new sheet. (i.e., cross-reference). If an existing sheet has extensive revisions, the existing sheet can be voided. The sheet being voided has a large "X" put through the middle of the sheet. The "X" is not to go through the title block. There is no bubble added to a sheet being voided.
10. The voided sheet shall be marked "VOID – REPLACED BY SHEET # ____." All these changes shall be approved and verified by the design consultant and signed by the Deputy City Engineer.
11. The replacement sheet will have a new sheet number. At no time will it be allowed to take the place of the sheet being voided.
12. The new sheet has the words "NEW SHEET" in the border area below the title block.
13. If a sheet is not being affected by the addition of the new sheet, do not note the change. Provide the title sheet, the sheet(s) being affected and the new sheet(s) to the Contract Processing Clerk (CPC) for inclusion in the addendum. The remaining drawing sheets are renumbered as part of the as-built process.

14. The copy of the new sheet and the voided sheet shall be included and noted in an Addendum to be sent to all plan holders and provided to all new purchasers of the plans.
15. Label the sheet(s) that contain(s) all the change(s) with the corresponding addendum letter, (e.g., "Addendum A", "Addendum B") at the bottom right hand corner of the sheet, below the title block.

2.5 CONTRACT PROCESSING PITFALLS

- 2.5.1 Each Master Mark-Up (MM) takes about 2-3 weeks of processing time. To avoid delays, it is the Department's goal to limit the number of reviews to only 2. The following is a list of potential pitfalls that shall be avoided:
- a) Premature submittal – Do not submit contract packages unless they have been determined to be 100% complete and ready for advertisement. Submitting packages early to just get things started has a negative impact and causes delays.
 - b) Total reliance on specifications automation program – The design staff may generate their specifications by any means they find best. Total reliance on computer programs and limited reviews by design staff shall be avoided.
 - c) Total reliance on quality control reviews (e.g., Specifications Engineer's) – A variety of quality control reviews are in place. However, they do not substitute the close attention to details by staff and a complete design work. Expecting the reviewers to catch the errors and omissions is not realistic and will cause delays.
 - d) Supplemental Special Provisions (SSPs) – Always contact CP for the latest appropriate contract language and SSPs. Do not recycle any existing projects for a new project.
 - e) Outdated SSPs – City regularly adopts The GREENBOOK and other standards, usually every 3 years, and issues its own updates and supplements frequently.

If a contract has been in the process for more than 3 months, the Consultant shall check for the latest updates to the Front End and SSPs.

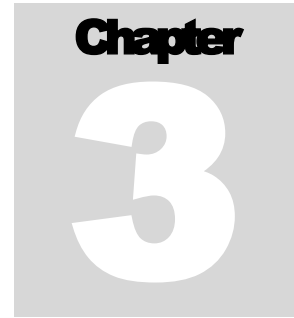
- f) Noncompliance with these standards – This document has been prepared to ensure uniformity and efficiency of contract processing. The requirements shall be followed; otherwise, the project may be delayed.

2.6 CONTRACT PROCESSING (CP)

- 2.6.1 All requests (i.e., Project Information Sheet [PIS]) for contract processing shall be submitted directly to CP intake by the Project Manager (PM).
- 2.6.2 The Master Markup (MM) is the routing document used to finalize the contract documents. The MM may go through several revisions. Revisions are numbered sequentially. On average, each MM takes approximately 3 to 4 weeks of processing time.
- 2.6.3 All contracts including addendum that are submitted shall be reviewed and approved by the Specifications Engineer (SE) prior to advertising.
- 2.6.4 The Addendum cover page shall be signed and sealed by the Deputy City Engineer or other licensed professional employed by the City when applicable.
- 2.6.5 To ensure the contract or addendum contains or references all required documentation, refer to the RTL (GO) Checklist (see Attachment E).

3.1 SIGNING AND STAMPING PLANS AND SPECIFICATIONS

- 3.1.1 Engineering Plans, Specifications, and Addenda that will go through bid and award for construction shall bear the signature and seal or stamp of the professional registrant in the responsible charge of design, the date of signing and sealing or stamping, and the expiration date of the certificate or authority. If the Section Head is unavailable, the Design Deputy Director signs and stamps where required. For more information, see California Business and Professions Code § 6735 and California Code of Regulations, Title 16, Chapter 5, §§ 400-476.
- 3.1.2 Only the authorized Deputy City Engineers (see Attachment C) may sign and seal or stamp the Plans, Specifications, and Addenda for the City Engineer. Other licensed professionals employed by the City may sign and seal the Final Plans, Specifications, and Addenda for the areas of their registration and with prior approval from the City Engineer.
- 3.1.3 If civil engineering Plans are required to be signed and sealed and have multiple sheets, the signature, seal, date of signing and sealing, and expiration date of the certificate or authority shall appear on each sheet of the Plans.
- 3.1.4 Revisions to the Plans shall be initialed and dated in the revision block column designated for initials by the same engineers or architects who signed the original work. If this cannot be done, another registered professional engineer or architect in the responsible charge of the Project's design affixes his or her seal to the Plans, enters his or her registration number, and enters his or her signature and the date, noting that his or her seal covers only the specific revision. All seals shall include the license expiration date.
- 3.1.5 The senior level person in the responsible charge of the Project's design will be required to sign and seal the Specifications (including Addenda). Addenda changing non-engineering materials such as Bid Opening Date (BOD) are exempt from this requirement.
- 3.1.6 If civil engineering Specifications have multiple pages, the signature, seal, date of signing and sealing, and expiration date of the certificate or authority shall



appear at a minimum on the cover sheet where provided, title block, or signature sheet.

- 3.1.7 As-built Plans shall be signed and sealed or initialed (as appropriate) by the Consultant (where available) and the design Section Head or Deputy Director responsible for the Project's original design where provided on the Plans. As-built shall be signed by the construction Deputy City Engineer (DCE) or Deputy Director who oversees the Project's construction where provided on the Plans.
- 3.1.8 Changes authorized and signed by the DCE's in the Field Engineering Division serve for the purposes of the California Code of Regulations.

Estimate - The projected cost of construction based on completed design and detailed cost estimates.

Engineer's Estimate represents the City Engineer's estimate of the most probable cost of construction.

4.1 CONSTRUCTION COST ESTIMATES

- 4.1.1 An accurate construction cost estimate is essential to successful project management, and a requirement for the service provider's and client's sound fiscal budgeting. Large variances between the engineering estimate and actual contractors' construction bids can delay the award of projects and creates additional activities to ensure the successful construction-award of the project.
- 4.1.2 The following provides general guidelines in the preparation of reliable construction cost estimates of Capital Improvement Program (CIP) Projects. The Project Manager determines the best construction cost estimating approach and level of effort suitable for the specific CIP project.
- 4.1.3 At a high level, a CIP's cost is made up of design and construction costs, each of which include contractual and City labor charges. City labor charges are incurred as part of design, administration, and processing activities. Table 1 below lists the high level elements that make up a project's costs. Administration and Engineering is estimated and accounted for under the Design Cost Estimate. Administration and Engineering includes the preparation of the construction drawings (specifications and plans) as well as the project management/design staff's administration of the project as a whole, from the start of design until project close-out.
- 4.1.4 These standards address the Construction Cost Estimate element (Table 1, item B), and all sub-elements (e.g. Engineer's Estimate, Contingencies, and Field Engineering). The Engineer's Estimate is the Consultant's estimate of the Construction Contract.

Table 1 – Cost Categories (Elements of a CIP's Total Budget/Costs)		
A - Project Design Costs	20% to 40%	Of Total Budget *
1 – Administration		
2 – Engineering		
B - Project Construction Costs	60% to 80%	Of Total Budget *
1 - Engineer's Estimate (Construction Contract)	30% to 60%	Of Total Budget *
a) Bid Item Quantities		
b) Mobilization	5% to 10% (1)	Of Construction
c) Traffic Control	5% to 10% (2,3)	Of Construction
d) Water Pollution Control	2% to 5% (1)	Of Construction
e) Bonds	2.5% (4)	Of Construction
f) Allowances e.g., Field Orders and City Contingency	2.5% to 7.5% (3)	Of Construction
2 – Contingencies	10% to 15%	Of Construction
3 – Construction Admin – Field Engineering	10% to 15%	Of Construction
* Total Project Budget (costs) = (Design Costs) + (Construction Costs)		
(1) Depending on location		
(2) Depending on ADT		
(3) Depending on project complexity and delivery method.		
(4) Per specification		

- 4.1.5 The range in percentage values listed in Table 1 reflect the varying complexities of a project, as well as the varying site conditions that may be encountered (e.g. roadway vs. building, pipeline vs. bike path).
- 4.1.6 Note that construction "contingencies" (item B2 in Table 1, page 2) is an amount other than the Engineer's Estimate (construction contract cost) that is set aside as a reserve for unforeseen construction conditions. This amount is applied to in-scope activities only and not to be used for out of scope items or activities. The Engineer's Estimate contains contingency amount in the form of Allowances.
- 4.1.7 Cost Estimate at 10% (Conceptual) Design (Planning Package): The operating division or asset planning group prepares this cost estimate once the project is identified and resources for implementing the project are being determined. This cost estimate accompanies the preliminary engineering package and is considered a rough estimate that requires field and technical validation by the assigned PM.
- 4.1.8 Cost Estimate at 30% (Preliminary) Design: This cost estimate is developed once the PM receives the planning (pre-design) package (10% Design) from the client department or the Preliminary Engineering Section. This estimate is the first

construction budget developed from project specific design criteria. This estimate is submitted with the 30% design. The framework of this estimate is based on quantities and unit price models developed from the design criteria, site layout, soils reports and the completed 30% Design Plans. This cost estimate has an expected accuracy of +30% to -15% of the actual cost of construction.

- 4.1.9 Cost Estimate at 60% Design: This cost estimate is an extension of the Cost Estimate at 30% Design. It is the interim budget cost estimate developed to conform to the latest project-specific design criteria. This estimate is submitted with the 60% design. The framework of this estimate is based on quantities and unit price models further refined by field investigation or revised assumptions from the design criteria, site layout, soils reports and the completed 30% Design. This estimate includes unit prices associated with environmental review, mitigation requirements, and discretionary permits. It has an expected accuracy of +20% to -10% of the actual cost of construction.
- 4.1.10 Cost Estimate at 100% Design: This cost estimate is an extension of the Cost Estimate at 60% Design. This is a semi-final cost estimate which is sent to Field Engineering Division along with 100% design plans for Constructability Review. This is the most detailed estimate of all the previous estimates, where the project scope is close to being completely defined. Given that this project is close to design completion and near-ready to advertise and award, cost figures shall reflect the most recent bidding updates. This construction cost estimate has an expected accuracy of +10% to -10% of the actual cost of construction.
- 4.1.11 Cost Estimate at Final Design: This cost estimate is referred to as the "Final Engineer's Estimate". This estimate is prepared once all plan check comments have been incorporated into plans and Constructability Review is completed. The estimate is intended to serve as the final project cost plan, a comparison to the interim budget level cost estimate, and the Analysis of Construction Bids.

4.2 COST ESTIMATION APPROACHES AND METHODS

- 4.2.1 There are 2 approaches to cost estimating, under each of which there are several methods (techniques) available:

a) Cost Estimating Approaches:

- Top Down - Relates to total costs, or costs of major elements, of similar projects. Under this approach, the estimate begins with a total figure and is then broken down into smaller parts, progressively detailing the estimate until all project elements are accounted for. The Consultant shall be cautious when using this approach since certain project details may be overlooked and would result in an undervalued total project cost. The Top Down approach utilizes a Work Breakdown Structure (WBS) method. This involves stating the work at a high level (top-down) and then breaking the work (e.g. products or tasks) into smaller components called activities. Each of the WBS activities identifies the associated dollar (labor and material) and scheduling (duration, start and end times) details. Other additional costs, not included in these items, are allocated as a percentage of the total cost components. These components appear as separate line items in the cost estimate summary as follows: Field Engineering, Bonds, Mobilization, Traffic Control, and Water Pollution Control. While this approach requires more effort than other methods, if the Consultant understands the work well and ensures that the required work is included in the work breakdown structure, an accurate estimate may be achieved.
- Bottom Up – Breaks the product into smaller elements and estimates each individually. The individual elements are then grouped back together to come up with an overall cost estimate. The Consultant shall use caution when using this approach because the risk associated with this approach is in being overly conservative on each of the individual elements to where the total cost estimate is inflated.

b) Cost Estimating Methods

- Ratio – Applies fixed ratios to costs of major elements based on previous similar projects. While all projects are considered to be unique, some projects are similar in scope to others. Using the Ratio cost estimating method, the CONSULTANT looks for similar projects previously (and most recently) completed and then estimates work

based on the actual cost required for the completed project. This is a reliable method for estimating work since it utilizes actual historical data. However, the projects shall be similar in scope and the completed project shall have detailed and accurate accounting.

- Parametric - This approach follows, in principle, that of the Ratio Method but instead of a fixed ratio, the Parametric Method uses a more complex correlation of smaller element costs to larger ones (e.g. based on size, quantity, complexity, technique, etc.).
- Standards - Estimates every project element using published or in-house standard cost for that element. Standard estimates may be ratio-based or parametric, but the data used is a compilation, and the source of the projects is unknown.

4.3 CONSTRUCTION COST ESTIMATE SUBMITTALS & UPDATES

4.3.1 Construction Cost Estimates are prepared at each stage of design (identified in Table 2). Additionally, in between any of the above stages of design, construction cost estimates are updated at a minimum of every 6 months, or when there is a change or new information on the project, or when the project is being re-initiated (removed from the shelf). These changes/ new information include:

- a) change in scope (reduction or additions)
- b) change in site conditions (recent construction activity or discovered utilities)
- c) recent spike or dip in material prices
- d) change in construction phasing

4.3.2 Anytime a project is shelved for more than 6 months, cost figures shall be updated to match the latest unit price data. Where projects have been shelved for more than 1 year, a site visit and a redefinition of all the project scope elements is necessary to reflect changes in existing field conditions.

Table 2 – Design Submittals			
Design Stage	Type of Submittal	Expected Accuracy	Submitted To
10%	Conceptual		Stakeholders/ Project Manager
30%	Preliminary	+30% to -15%	Stakeholders/ Client/ Permit Applications
60%	Intermediary	+20% to -10%	Client
100%	Substantial	+10% to -10%	Citywide
Final	Final	+10% to -10%	Advertise

- 4.3.3 The Consultant provides the following types of construction cost estimates (in current dollars) to the PM for review and comments during design (see Table 2).
- 4.3.4 Each cost estimate is titled to correspond with the design completion stage and the type of estimate. The cost estimate includes an assessment of the difficulties inherent in the construction work and documents the price determinations and the assumptions for preparing the cost estimates. This may include factors such as labor conditions, construction equipment, construction supervision, material costs, and equipment installation costs. All reasonable costs a construction Contractor can expect to incur are also included.
- 4.3.5 The construction cost estimate includes the line items listed in Table 1.
- 4.3.6 Following completion of the 100% Design, the Consultant participates in cost estimate review meetings with the PM and QA/QC Group to reconcile cost estimates and discuss each party's respective cost estimate.

4.4 CONSTRUCTION COST ESTIMATION ACCURACIES

- 4.4.1 The accuracy of the estimate is dependent upon what is known, what is assumed, and what is unforeseen at the time the estimate is prepared. Furthermore, it shall be noted that, while the Engineer's Estimate attempts to forecast the cost of the proposed work, the estimate may not always closely correlate to the low bid. Variances are expected because of the nature of Public Works contracting. Items that contribute to these variances include:

- a) Errors by contractors in preparing bids (i.e. both quantity takeoff & pricing errors).
- b) Competitive nature of bidding as a result of market conditions, number of contractors submitting bids, importance of the project to a particular contract or contractors.
- c) The level of refinement of the scope of the project and/or the project construction documents. (i.e., completeness and accuracy of the drawings and subsequent interpretation of the drawings by the bidders).
- d) Significant fluctuations in the cost of materials, labor, and equipment.
- e) Recent experience with similar projects.
- f) The complexity of the project, type of construction, and age of existing facilities.

4.5 CITY FORCES WORK

- 4.5.1 All City furnished equipment or materials and all labor costs (e.g. those associated with Public Utilities Department (PUD) system shutdowns, connections, and water service highlining) are excluded from the construction cost estimates submitted by the Consultant unless otherwise required by the PM. Installation costs for these items incurred by the Construction Contractor are included in the cost estimate. Note that non-contractor expenditures that would be incurred as part of constructing the project (e.g. environmental mitigation) shall be identified and noted in the overall project budget.

4.6 MAINTENANCE COSTS

- 4.6.1 The costs associated with long term maintenance (irrigation, landscaping, long-term warranty, etc.), shall be included in the construction cost estimate.

4.7 COST ESTIMATES FOR PROJECTS RECEIVING FEDERAL AND STATE GRANTS

- 4.7.1 For projects funded with Federal or State monies, the Consultant shall take into account increases per unit item for costs associated with increased wage rates (prevailing wages) that the Contractor is required to pay their employees.

4.8 COST ESTIMATING SPREADSHEETS

- 4.8.1 While the use of computerized cost estimating software is preferred if available, spreadsheets are considered equally dependable tools for generating cost estimates, provided they have the most recent unit prices and most accurate quantities inputted. Spreadsheets shall clearly label the item, quantity, and unit price applied, and the construction item shall be clearly identified on the associated Plans and Specifications' bid list.

4.9 COST ESTIMATES DOCUMENTATION

- 4.9.1 The Consultant maintains a file documenting justification for the cost estimations prepared at all stages of design. The documentation file includes, at a minimum, the sources, methods, quantities, and prices used in developing the cost estimates (as applicable) such as:
- a) A reference of the source of unit prices used.
 - b) Quotations with estimated installation costs.
 - c) Completed project title(s) & CIP number(s) used for cost comparisons.
 - d) Details, sections, and sketches used to perform typical quantity takeoffs.

4.10 BID ITEM LIST (COST ESTIMATE)

- 4.10.1 Use the appropriate unit of measurement. Use of lump sum pay items shall be minimized, in particular items that are readily measured. Pay items with subsidiary and lump sum items are difficult for Contractors to bid and difficult for the Engineer to administer during construction, especially in cases of changed conditions or changed quantities. Complex projects with many parts and

elements (e.g., buildings) may be advertised with a limited number of lump sum bid items. The guideline for breaking down those projects is to divide them into distinct physical elements such as building, parking lot, landscaping, playground, etc. City's standard lump sum items (e.g., Bonds, Mobilization, Field Order, SWPPP, etc.) remain unchanged.

- 4.10.2 Submit the City Standardized bid item list or cost estimate in MS Excel spreadsheet format as one file. Each pay item shall have a reference to the specification subsection number where the measurement and payment clause can be found. This information shall be listed under a separate column. Each item of Work shall have a pay item. All unit price(s) and extension(s) are to be included. The Master Bid List is provided for the Consultant's use with the Boiler Specifications upon request.

As-builts - The drawings prepared from the approved Red-lines to reflect the actual product built.

Boiler Specifications - The City's standard contract provisions that have been established to improve consistency and uniformity. Specifications may be technical or non-technical (i.e., contract administrative clauses).

Bond - Bid, performance, and payment bond or other instrument of security.

Change Orders - The legal document prepared by the City and executed by both parties (i.e., the City and the Contractor) to legally modify part(s) of the original contract subject to the limitations set by law.

City Supplement - The City's Amendment to The GREENBOOK.

Contingency - An amount other than the Engineer's Estimate that is set aside as a reserve for unforeseen construction conditions. This amount is to be used on in-scope items only and not to be used for scope creep items.

Contract Documents – The Agreement, Addendum, Invitation to Bid, Instructions to Bidders, Bid and documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award when attached as an exhibit to the Contract, Bonds, permits from jurisdictional regulatory agencies, Supplementary Special Provisions (SSP), City's EOCP Requirements, City Supplement, Plans, Standard Plans, Construction Documents, Reference Specifications listed in the Invitation to Bid or the RFP for Design-Build contracts, Request for Qualifications (RFQ), Statement of Qualifications (SOQ), Request for Proposals (RFP), and modifications issued after the execution of the Contract e.g., Change Orders.

Deputy City Engineer - Senior level engineers designated by the City Engineer to duly approve plans and specifications for construction on behalf of the City Engineer.

Deputy Director – Executive level unclassified management in charge of a division within the department.

Final Plans & Specifications – Plans and Specifications completed, signed, and sealed and ready for Bid and Award.

5.1 DEFINITIONS

Mobilization - Process of activating resources including labor, equipment, and supplies. The process includes setup at or near location of work to attain full or partial readiness to commence construction activities.

Prevailing Wages: Higher wages imposed on federal and state funded projects.

Project Manager – The individual with the management responsibility for the Project.

Red-lines - Plans with annotations of changes made during construction, in red, to reflect the actual product built during construction whether concealed or visible.

Section Head – Senior level engineer or architect in the responsible charge of Project.

Special Provisions – Additions and revisions to the Standard Specifications setting forth conditions and requirements peculiar to the Work.

Shelved Project - A project where no active processing or review has been conducted.

Standard Design Guidelines - Technical standard design criteria and requirements which are established for consistency, cost saving benefits and compliance with Local, State and Federal regulations. They are referenced by the engineering staff on routine and typical construction projects.

SWPPP - Storm Water Pollution Prevention Plan for permit compliance during construction activities.

Unit Price - The amount stated for a single unit of an item of work.

Work - That which is proposed to be constructed or done under the Contract or permit, including the furnishing of all labor, materials, equipment, and services including the furnishing of all labor, materials, equipment, and services.

WBS (Work Breakdown Structure) - The list of tasks and subtasks defined for a project. This list is done in a hierarchical fashion, grouping sets of related tasks under a common parent task.

ATTACHMENTS

- A.** City Engineer's Memo dated 03/22/2007
- B.** City Engineer's Memo dated 09/21/2009
- C.** City Engineer's Memo dated 06/02/2008
- D.** GREENBOOK Style Guide 2010, Ver. 1.0
- E.** Standards & Quality Control RTL (GO) Checklist

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